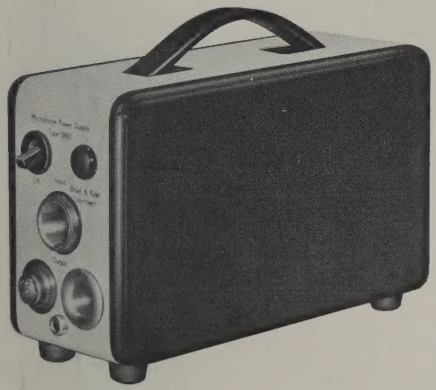
2801

INSTRUCTIONS AND APPLICATIONS

Microphone Power Supply Type 2801



The Microphone Power Supply extends the use of the B & K Condenser Microphones into applications like phase shift and rise time measurement by oscilloscopes, triggering of oscilloscopes, multichannel tape recordings for later analysis, stationary noise monitoring stations etc.

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- Wide Range Vacuum Tube Voltmeters

Microphone Power Supply

Type 2801

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Description

General.

The Microphone Power Supply is designed to be used in conjunction with Brüel & Kjær Microphones in cases where the normal B & K Amplifiers or Analyzers are not available, where tape recording of data are required or where extremely long extension cables must be used between the microphone or Vibration Pick-up Preamplifier and the succeeding amplifier. It has been designed as a portable mains driven unit for two specific purposes:

1. To supply the necessary filament and anode voltage to the cathode followers Type 2612, 2613, 2614 or 2615, or the Preamplifier Type 1606, and the necessary polarization voltage to the B & K condenser microphones.
2. To transform the output impedance of the cathode follower or preamplifier into impedance of 50 ohms, 200 ohms or 200 ohms symmetrical.

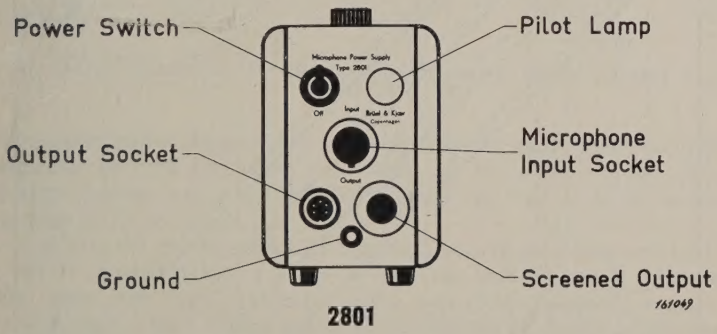


Fig. 1. The Microphone Power Supply Type 2801.

Technical Description.

The Type 2801 contains a filament and stabilized anode and polarization voltage supply which will vary by less than 1 % for a 10 % variation in mains voltage. The unit can be operated from mains voltages of 100—115—127—150—220 or 240 Volts with frequencies of 50 to 400 c/s. It is equipped with a seven-poled "Input" socket similar to those used in the B & K

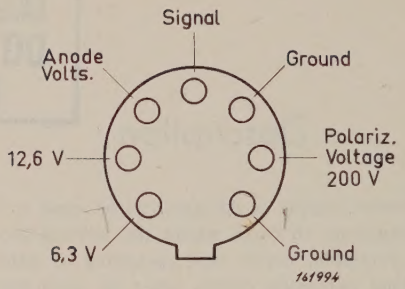


Fig. 2. Socket connections for the input of the Power Supply (viewed from outside).

amplifiers in order to suit the cathode follower plug. The connections to this socket are shown in Fig. 2.

The input signal is fed to two "Output" sockets, one of which is a standard B & K coaxial socket and the other a six-pin socket. Between the "Input"

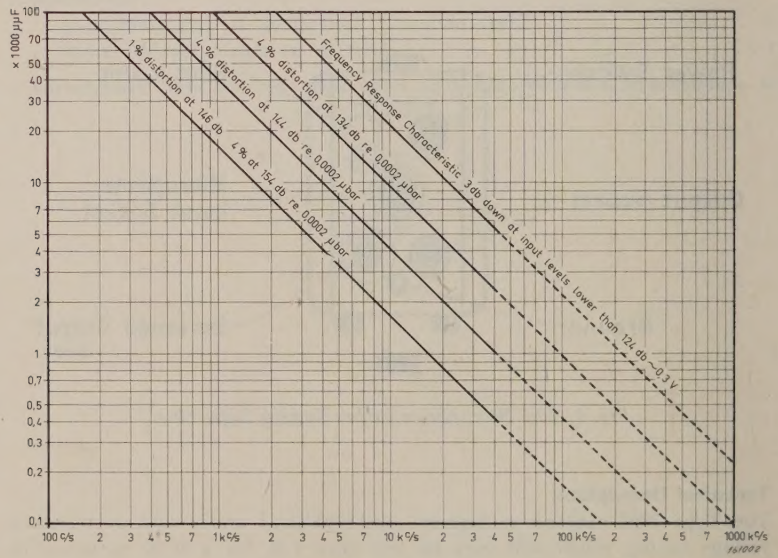


Fig. 3. Curves showing the effect of loading a B & K Microphone Type 4133 or 4134 with associated Cathode Follower supplied from the 2801 by different capacities.

and the coaxial "Output" a 4 μF series capacitor has been inserted. This socket can be conveniently used when the B & K Cathode Followers are to be connected to amplifiers which do not contain a blocking capacity in the input circuit. It may be loaded by 50 kΩ with no limiting effect on the dynamic range of the B & K Microphones. If the output is loaded, however, by impedances smaller than 50 kΩ the effect of this load can be determined from the graph shown in Fig. 3.

The six-pin socket allows a number of possible output connections and an emitter-follower stage and a transformer have been incorporated in the Power Supply Type 2801, so as to provide output impedances of 50 ohms, 200 ohms and 200 ohms symmetrical as well as direct output. Fig. 4 shows the connections to be made to this socket to obtain the various output facilities. The connection marked "Direct" connects straight through the instrument from input to output. All the other connections of the multi-

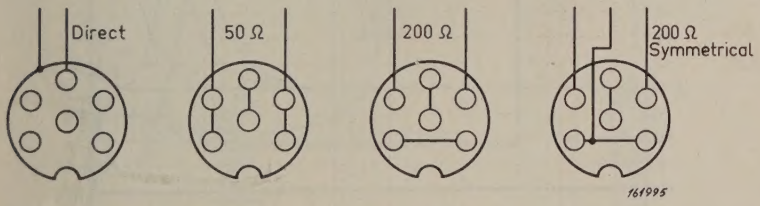


Fig. 4. Socket connections for the multi-poled output socket (viewed from outside).

poled output socket connect the above mentioned emitter-follower and transformer between the input and output of the Power Supply. The frequency response will, when these connections are used, be linear in the range from 20 c/s to 20 kc/s.

Above 20 kc/s the characteristics of this stage appear as shown in Fig. 5. The curves show that it is possible to vary the high frequency response within rather wide limits. Therefore, if this part of the frequency range is of interest, one of the optimum characteristics for the particular application can be chosen. To make a rough calculation it may be helpful to know that many screened cables have a capacity of 70 to 100 pF/m. It should be emphasized that in every instance the transformer stage responds linearly to frequencies up to and well above 20 kc/s.

The input to output attenuation of the transformer stage for the 200 Ω output is approximately 10 db unloaded. By loading the output with 200 ohms the attenuation will be 12 db. For the 50 ohms output the input to output attenuation will be approximately 16 db unloaded, and 18 db when loaded by 50 ohms. When these outputs are used for absolute measurements, it is recommended to calibrate the complete measuring arrangement, for example

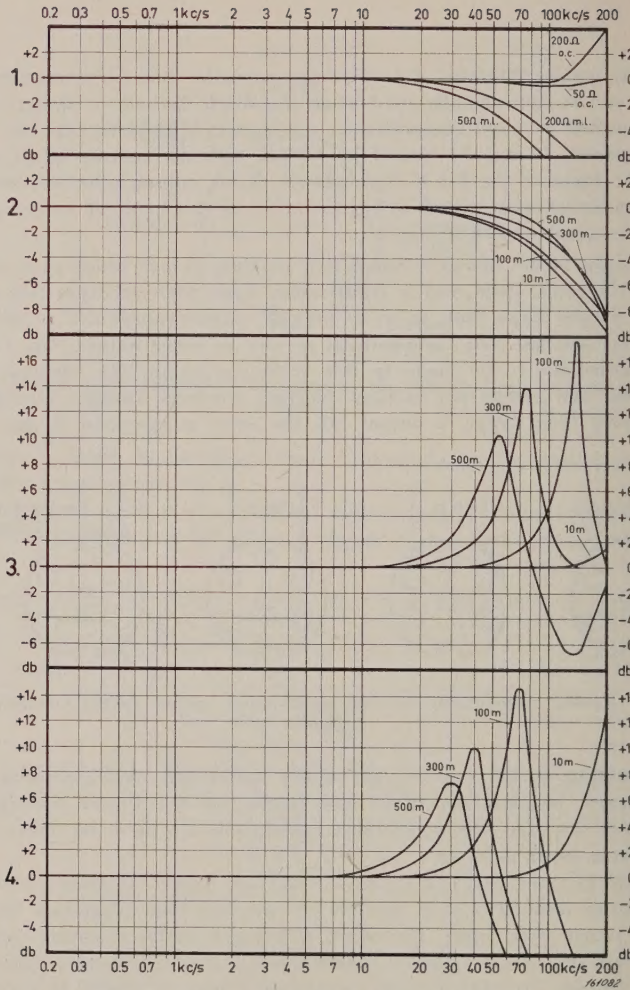


Fig. 5. Frequency response curves for various loads of the transformer / emitter follower stage.

1) *The curves marked 200 Ω o.c. and 50 Ω o.c. refer to open circuit conditions of the 200 Ω and 50 Ω output impedance connections respectively. The curves marked 200 m.l. and 50 m.l. refer to the same outputs as mentioned above but connected to matched loads (i.e. 50 Ω to 50 Ω, 200 Ω to 200 Ω).*
2) *50 Ω output loaded by various length of cables, the cable being terminated into its image impedance.*
3) *50 Ω output loaded by various length of cable, the cable being "open" at the other end.*
4) *200 Ω output loaded by various length of cable, the cable being "open" at the other end.*

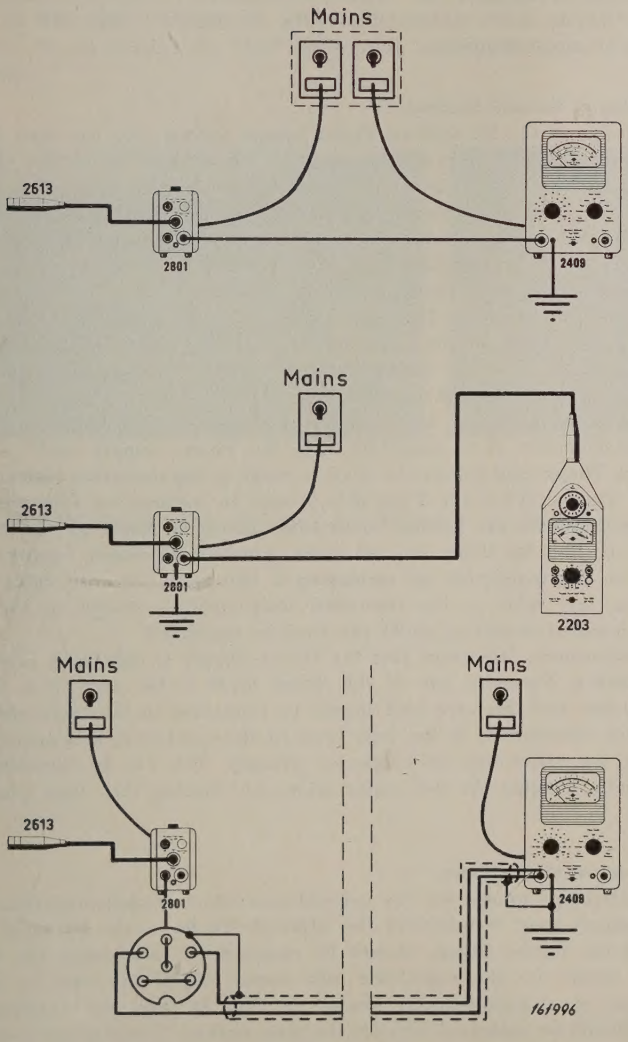


Fig. 6. Various methods of ground connection to minimize hum from the Microphone Power Supply.
a) 2801 used in conjunction with other mains driven measuring instruments
b) 2801 used in conjunction with battery-operated instruments.
c) Correct use of the 200 ohms symmetrical output facility of the 2801.

by means of the Pistonphone Type 4220 in case of Sound Level measurements or by the small shaker table of the Preamplifier Type 1606 in case of vibration measurements.

Minimizing of Ground Current.

In the design of the Microphone Power Supply special care has been taken to minimize ground current due to stray capacitance from the power transformer by using a grain-orientated C-core transformer. Also stray induction is considerably reduced by heavy screening and by adjusting the mounting of the output transformer for minimum hum pick-up seperately in each individual Power Supply. It may, however, be necessary to ensure that the equipment is correctly grounded.

The ground current from Type 2801, when correctly grounded, is approximately 4 μA, which means a voltage of 4 μV per ohm for the attached cable (Common screened cables of good quality will normally have a resistance of 1 ohm per 100 m length).

If the Microphone Power Supply is used in connection with other mains driven instruments it is important that the Power Supply itself is not grounded. The ground connection shall be made at the connected instrument, see also Fig. 6a. When the Type 2801 is used in conjunction with battery-driven instruments the ground connection should be made at the Power Supply, see Fig. 6b. Using the 200 ohms symmetrical output facility it is possible to eliminate hum by employing a two-cored screened cable and grounding this cable at the connected instrument as shown in Fig. 6c. Several hundred meters of cable can then be employed.

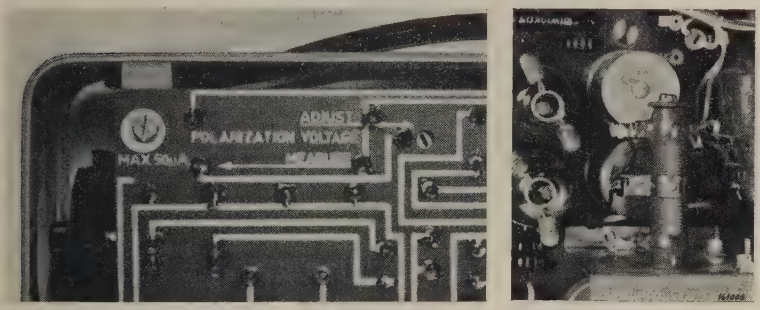
It is, furthermore, important that the Power Supply is connected correctly to the mains. Normally one of the mains leads is the zero of a three-phase system and this zero lead should be connected to the "zero end" of the mains transformer. If the hum level in the measuring arrangement is too high, the mains may be connected wrongly. This can be remedied by simply interchanging the two mains wires (i.e. turning the mains plug by 180°).

Adjustment of the Voltages.

The polarization voltage for the microphones which is delivered from the Power Supply may, if necessary, be adjusted. To do so the left-hand side cover of the Power Supply should be removed by unscrewing the three holding screws on the right-hand side cover. Adjustment can be made by means of a potentiometer shown in Fig. 7a, and the polarization voltage should be measured between the pins marked "Polarization Voltage" and "Ground".

It is important to use a voltmeter with a maximum consumption of 50 μA. When extremely long microphone cables (more than 100 meters) are used between the input of the Power Supply and the B & K Cathode Follower or

Preamplifier, it may be necessary to adjust the filament voltage to the losses in the cable. This can be made by means of a wire-wound resistor P2 (Fig. 7b), by moving the "tap" downwards whereby a higher voltage is obtained.



a b

Fig. 7. Photos showing the adjustment potentiometers of the Power Supply.

Applications

Tape Recording of Sound and Vibration Data.

When noise and vibration data are measured in the field, such as the measurement of noise during take-off of jet aircraft, missile launching, traffic noise etc., it is often necessary to record the noise for later analysis in the laboratory. Under these circumstances it is highly convenient to use a B & K Microphone with Cathode Follower or Accelerometer with Pre-

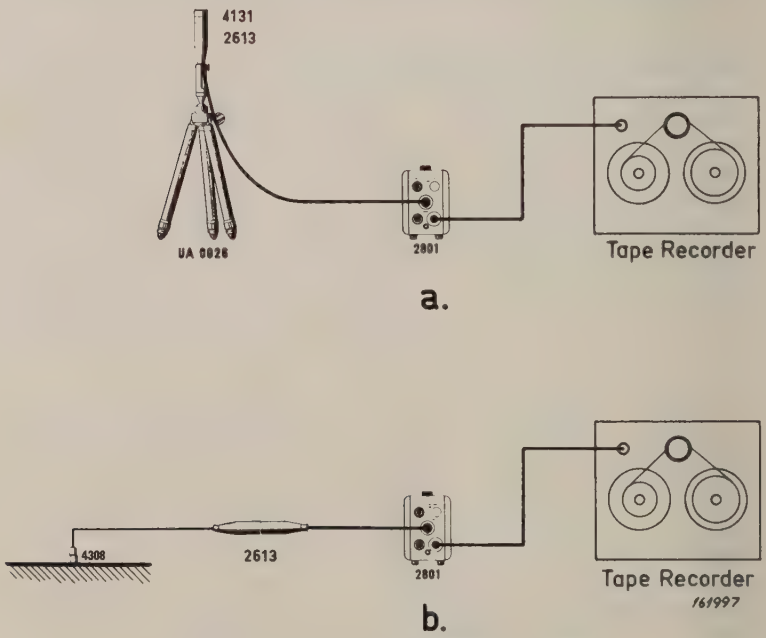


Fig. 8. Tape recording of measuring data.
a) Sound measurements.
b) Vibration measurements.

amplifier directly connected to the tape recorder as shown in Fig. 8. As the Cathode Follower and Preamplifier require an external power supply the Type 2801 is ideal as it is a light-weight easy-to-carry apparatus. It is also advantageous to use the transducers and preamplifiers in combination with the Type 2801 for multi-channel tape recording.

Sound Measurements on Airfields.

The Microphone Power Supply is very convenient to use when long connecting cables have to be employed for example between the B & K microphone and the measuring station. A typical example of this is sound measurements on airfields where many microphones may be placed at quite some distances and connected to a Sound Level Meter or an Analyzer in a central control room (B & K Type 2211). Permanent outdoor installation of the half-inch microphones can be made by using the rain cover Type UA 0056.

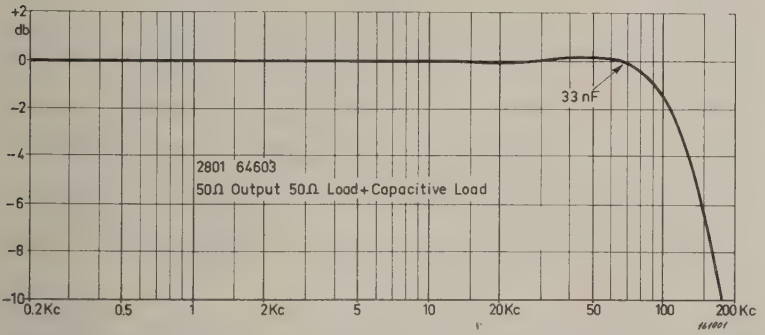


Fig 9. Frequency response curves for the B & K microphone supplied from the 2801 and connected to the measuring station by means of a cable of 500 m length (33 nF).

Fig. 9 shows the frequency response of a cathode follower supplied from the 2801 and loaded by 500 m of screened single-cored cable. The capacity of this cable was approximately 70 pF per meter and the 50 ohms output facility was used on 2801.

The negligible influence on the audio frequency response is clearly noted, and as most noises are of "lower" frequencies, see Fig. 10, the use of even very long*) connecting cables will not influence the accuracy of the measured result to any important extent.

*) The upper limit of cable length will normally be set by its "electrical length", i.e. the length as compared to the electromagnetical wavelength of the transmitted signal.

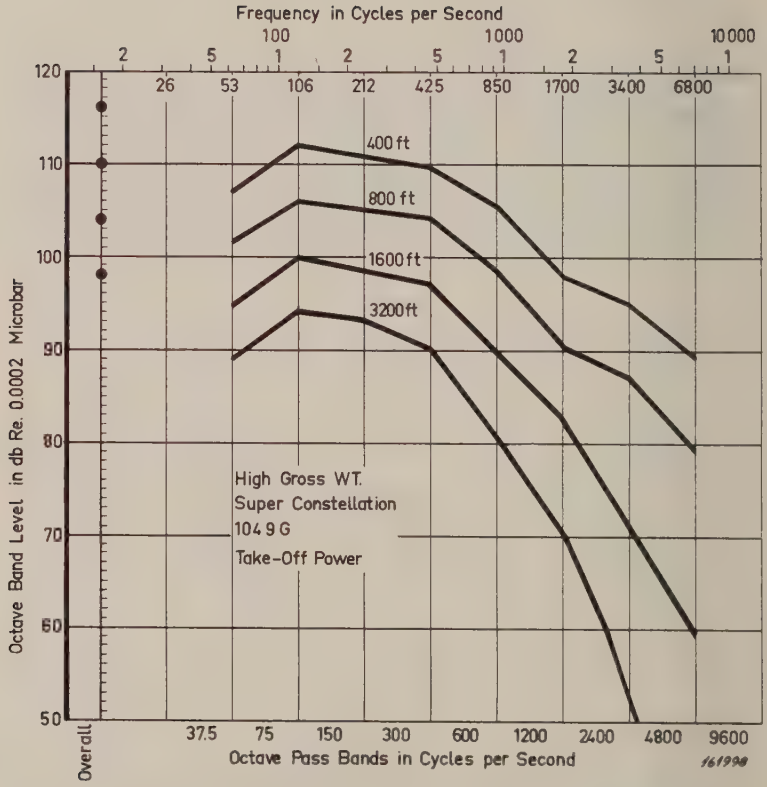
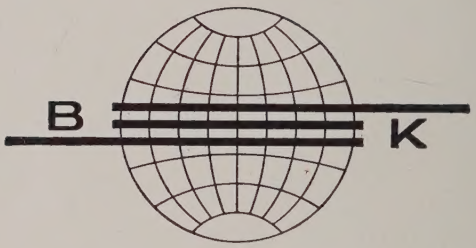


Fig. 10. Typical frequency spectrum of aircraft noise during take off. (From Noise Control, Vol. 5. No 1—1959).

Characteristic Data for Type 2801 when Used with the B & K Microphones.

			Direct	200 Ω	50 Ω
Input/Output Voltage Ratio	Unloaded		1 : 1 (0 db)	3.16:1 (—10 db)	6.3:1 (—16 db)
Input/Output Voltage Ratio	Loaded		see Fig. 3	4:1 (—12 db)	8:1 (—18 db)
Peak output voltage			30 V	1 V	0.5 V
Noise 20—200000 c/s	For cathode follower 2612/13/14/15 50 pF dummy across input terminals		30 μV	10 μV	5 μV
Hum 50—180 c/s			8 μV	3 μV	1.5 μV
Nominal sensitivity and dynamic range (RMS)	Cartridge 4131/32 Cathode Follower 2612-13	Sensitivity	5 mV/μbar —46 db re. 1 V	1.6 mV/μbar —56 db re. 1 V	0.8 mV/μbar —62 db re. 1 V
		Dynamic Range	30—146 db	30—126 db	30—126 db
	Cartridge 4133/34 Cathode Follower 2614-15	Sensitivity	1 mV/μbar —60 db re. 1 V	0.3 mV/μbar —70 db re. 1 V	0.15 mV/μbar —76 db re. 1 V
		Dynamic Range	46—160 db	46—140 db	46—140 db
	Cartridge 4135 Cathode Follower 2614-15	Sensitivity	0.2 mV/μbar —74 db re. 1 V	0.066 mV/μbar —84 db re. 1 V	0.033 mV/μbar —90 db re. 1 V
		Dynamic Range	64—174 db	64—154 db	64—154 db
	Cartridge 4136 Cathode Follower 2614-15	Sensitivity	0.1 mV/μbar —80 db re. 1 V	0.03 mV/μbar —90 db re. 1 V	0.015 mV/μbar —96 db re. 1 V
		Dynamic Range	70—180 db	70—160 db	70—160 db



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